

DRG-Based CubeSat Inertial Reference Unit (DCIRU), Phase II

Completed Technology Project (2017 - 2021)

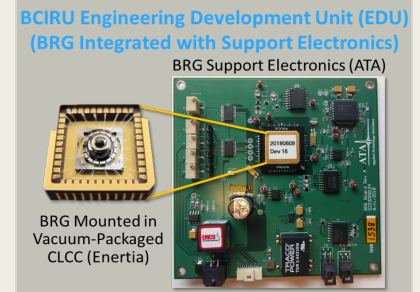


Project Introduction

CubeSats currently lack adequate inertial attitude knowledge and control required for future sophisticated science missions. Boeing's Disc Resonator Gyro (DRG) integrated into the ATA DRG-based CubeSat Inertial Reference Unit (DCIRU) in conjunction with a star tracker or sun sensor would provide the Inertial Attitude Knowledge (IAK) and position measurements needed for precision acquisition, pointing, and tracking (APT) control. Accurate attitude and position measurements provided by the DCIRU would also be required for future CubeSat constellation or formation flying missions, and for laser communication between other CubeSats, other satellites or Earth. There are currently no small Inertial Reference Units (IRUs) suitable for CubeSats that exist due to size, weight, and power constraints. The ATA/Boeing Team is proposing the development of the DRG for potential integration into the DCIRU in Phase II. The highly symmetrical and scalable DRG disc standing wave design was selected by DARPA and NVESD as the only MEMS design capable of navigation grade performance. The DRG consists of a MEMS disk resonator that provides rotation sensing capable of both tactical and navigation grade precision.

Anticipated Benefits

ATA has successfully developed and transitioned SBIR innovations into government and commercial programs. One example is our recent success transitioning technologies first developed on the NASA Phase I SBIR, MIRU I. The DRG-based CubeSat Inertial Reference Unit, or DCIRU, will be integrated into an original design that will directly benefit NASA's future GNC systems for future CubeSat missions, i.e., NASA's CubeSat Launch Initiative (CLI) that actively solicits CubeSat opportunities for low cost space exploration. ATA's DCIRU specifically addresses NASA's desire for advanced autonomous navigation and attitude control that would facilitate significant advances in independence from Earth supervision by enabling high bandwidth CubeSat inertial attitude knowledge (IAK) and control required for future sophisticated science missions. There are currently no precision space-qualified IRUs available for CubeSats today due to SWaP limitations. The proposed DRG/DCIRU developments will ultimately fulfill the crucial need for a CubeSat compatible IRU. ATA is working to insert our DCIRU technology into many air and space markets. Potential applications include missions having stringent line-of-sight stabilization (LOSS) and IAK requirements. OIRUs are used in airborne HEL and Intelligence, Surveillance and Reconnaissance (ISR) applications along with space-based Laser Communications (Lasercomm). ATA anticipates capturing significant market share, as OIRUs are a very specialized product niche in which we own most of the Intellectual Property (IP). We continually work to enhance and improve our OIRU designs and technology to maintain our competitive edge while reaching out to competitors to supply their specific mission needs. Our goal is to be the Number One supplier of DCIRUs worldwide.



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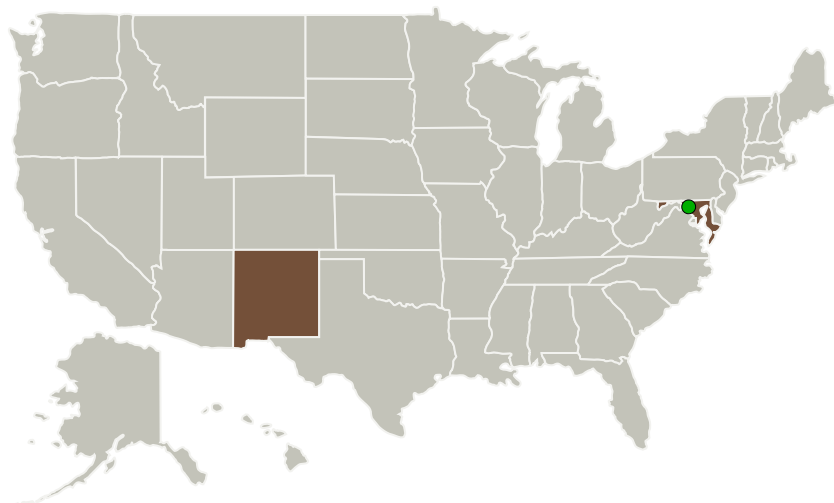
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Applied Technology Associates	Lead Organization	Industry	Albuquerque, New Mexico
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland	New Mexico
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Project Transitions

**April 2017:** Project Start**February 2021:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/140879>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Applied Technology Associates

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Managers:Scott R Starin
Joseph Famiglietti**Principal Investigator:**

Darren Laughlin

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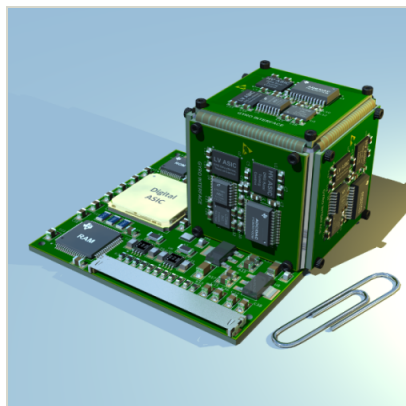


✓ **April 2021:** Closed out

Closeout Documentation:

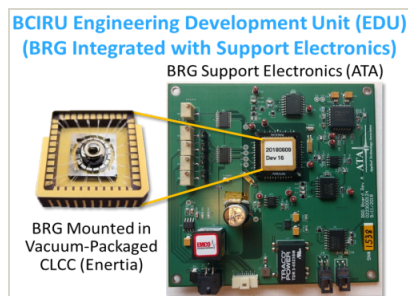
- Final Summary Chart PDF(<https://techport.nasa.gov/file/140880>)

Images



Briefing Chart Image

DRG-Based CubeSat Inertial Reference Unit (DCIRU), Phase II
Briefing Chart Image
(<https://techport.nasa.gov/image/127336>)

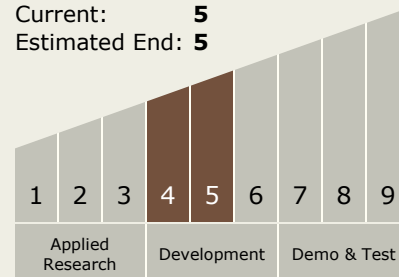


Final Summary Chart Image

DRG-Based CubeSat Inertial Reference Unit (DCIRU), Phase II
(<https://techport.nasa.gov/image/130839>)

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System